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The Welsh Engineers' and Founders' Association
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Commercial Co-operation

Some little time ago there was a lengthy correspondence in "The Times" detailing the loss whilst at the laundry of a pair of underpants, and the inability of the injured party to convince the Board of Trade that here was a case where there should be issued to him the requisite number of coupons for replacement. A quite interesting story of "red tapism" was revealed intermixed with a modicum of humour; yet it is not without its serious aspect. The relationship between Government Departments, manufacturers, wholesalers, retailers, and the ultimate consumer bristles with analogous cases. Somebody, sometime had to decide whether the requirements of the Canadian Forces in Britain ranked as the equal of those emanating from a Government Department, even though the request was for a cooking stove for an officers' mess. It has always been possible to requisition the raw materials for small essential orders involving iron and steel, providing the particulars were set out properly on Form M. For orders involving less than 1 cwt. of iron and steel, a new scheme has been devised, and it is set out in some detail in that section of this issue devoted to commercial matters. This modification largely does away with problems analogous to the lost underpants, for now manufacturers can lump together all their small but still essential orders and apply for the necessary raw material in bulk. Thus a materially decreased volume of form-filling is now to be associated with the ability to help along customers to "get away" with their particular jobs. It will be seen from the schedule referred to that many of the items listed as entering within the ambit of the scheme are the productions of the foundry industry; others which we have included relate to items which foundries may want in connection with their own maintenance.

This new scheme is the latest example of more enlightened co-operation between Government Departments and industry, and, under the caption of "Co-operation for Production," was the theme of Sir Edward Crowe's inaugural address as chairman of the Council of the Royal Society of Arts. In the main, he dealt with the function of the Regional Boards of Production Executive. Like the technical co-operation of which so much has appeared in our columns in recent weeks, and which apparently is still unfinished, the machinery for commercial collaboration is well established and is functioning with varying degrees of success in different parts of the country. The great factor, as Sir Edward pointed out, is that, whilst these Boards possess no executive functions, their membership includes people who know their way about Government Departments and also the industry in the region they serve, so that they can, and do, free bottle-necks. Of importance in this connection has been the creation of Clearing Centres. These are served by two technical officers, with the usual secretarial staff, and are helped and guided by an Advisory Committee consisting of three employers and three trade unionists. One of their main jobs is to see that every machine tool in the district covered is being used to the best advantage. Thus, "firms which find their production hampered by serious bottle-necks turn to the Centres for advice and help, and can very often be put into touch with concerns which have the required machine tools temporarily idle." In all there are 34 Centres serving the ten regions, of which London and the South-Eastern region has twelve. The relatively large number found necessary for the London area is due to the fact that Guildford is much more of an unknown region to the industrial managements of, say, Rochester than is the case with, say, Sheffield and Birmingham. It will ultimately benefit the manufacturing industries of London to know more of their composition, diversity, immensity and distribution. The London industries employ some 400,000 workpeople!

There is another aspect to the work of the Boards, and that is in connection with labour supply, where efforts are made to reconcile the demands of the producers of munitions, food and goods for export. Here, indeed, is a difficult task, and a somewhat limited personal survey of conditions inclines us to the belief that there should be a minimum of export to other areas, as we have noticed that this action usually involves the "import" of a man from the area to which a man has been transferred.

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Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Co-operation*

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—I am disappointed to find that no one has replied to the letter headed "Co-operation," which appeared in your issue of October 16, especially as you have thought fit to emphasise your correspondent's remarks in your leading article. "A.M.I.B.F." has, I think, given a completely false impression of our foundry industry which will do harm if not corrected, and with that generalising habit so common to the anonymous letter writer, he gives no indication as to which of the many branches of the casting industry he refers.

I cannot speak for all the industry, but I have some knowledge of the steel side. For many years before this war there was between the more progressive steel-making firms very close and friendly co-operation and interchange of visits and information with regard to steel-making matters. To me one of the most hopeful aspects of this war has been the rapid way in which this spirit of friendly helpfulness has spread among the steel foundries.

My mind turns to thoughts of what might be called (out of respect for the Censor) a "special container," over the making of which there have been countless interchanges of visits, correspondence, drawings, pattern tackle, etc. Much help has been willingly given and received, and in many ways these parts are being manufactured with success. I have visions of future years, when the men at present responsible for this production are grandfathers and greybeards, will still be arguing the pros and cons of this job and stoutly maintaining that their own methods were quite the best!

This particular job, which is now almost hoary with age, has been the forerunner of many similar occurrences, and I am personally aware of a very large exchange of information given over a wide variety of war work among steel foundries with the sole object of more 'planes, more tanks, more guns. Indeed, at the present time there are technical men from the steelfounding industry, released at considerable sacrifice, going round this country helping and advising ironfounders and others in the manufacture of all steel castings.

Has "A.M.I.B.F." searched his conscience on this matter, as I cannot help but feel that the fault lies with himself? Has his method of approach been correct, as I suspect from his remarks that he is looking for something which is not to be found? He says that "he had the pleasure of meeting a foundry manager who knew why they were not making a success of the casting in question, but would not divulge the successful method used." This I cannot believe. Is he looking for that paper packet of "mystery" being slipped surreptitiously into the ladle of metal at the critical moment when its surface bears a "cauliflower craze"? Has he visions of a closely guarded compo mill manned with deaf mutes? Has "A.M.I.B.F." paused to consider that this foundry manager may know so much about this job that he realises in his heart how little he does know; and that therefore he may be much more hesitant to give advice than one who knows much less? Has he come openly to him and said: "I am in difficulties here, here and here: can you help me?" Has he asked this foundry manager to come into his shop and see what he is doing?

I know little of the manufacture of aircraft castings, but I do know that they have to be tackled in distinct stages, which I myself put in the following order of importance: First, the casting must be true to shape and size; because without this, the finest other qualities will be of no avail when it reaches the machine shop. Second, it must be radiographically sound. Third, it must be up to specification and quality.

These results are not achieved by any one special secret method, but only by very close and exacting application to detail from beginning to end, and although these results may be obtained under the guidance of one man, their achievement is only obtained by the willing help, craft and skill of many.

To sum up, I do not believe, speaking from my knowledge of the steel founders of this country, that there is any foundryman with anything real and substantial to contribute to our industry, who would knowingly withhold it from anyone else who could usefully apply it to our common war effort.

MALCOLM BROWN.

49, Oakholme Road, Sheffield, 10.
November 4, 1941.

* Received while the issue of November 6 was in the press, hence this letter was written before that from the Ministry of Supply was published.

Notes from the Branches

Falkirk Section.—The first meeting of the 1941-42 winter session of the section was held in St. Francis' School, Meek's Road, Falkirk, on Friday, October 31, 1941. At the outset of the meeting, which was attended by a very large number of members, Mr. Alex. Cunningham, the retiring President, occupied the chair. After the adoption of the minutes, Mr. Cunningham addressed the members, expressing in a few well-chosen words his appreciation of the support that they had given to him during his year of office. He had thoroughly enjoyed the experience, and he took great pleasure in handing over the reins of office to Mr. Thos. Tyrie, B.Sc., the Scottish Superintendent of the British Cast Iron Research Association. In Mr. Tyrie the members would find all the qualities necessary for a popular and successful President.

Mr. Tyrie then spoke, thanking the members for honouring him by election to the presidency, also Mr. Cunningham for his very kind remarks. He (Mr. Tyrie) did not intend at this time to prolong his remarks, as the speaker for the evening, Mr. J. G. Pearce, M.Sc., Birmingham, had a very limited time at his disposal. One fact was certain, however, that he (Mr. Tyrie) would do his utmost to be worthy of the office he now held.

The new President then introduced the speaker, Mr. J. G. Pearce, who delivered an address on "Phosphoric High Duty Irons for Engineering Purposes." This was well illustrated with lantern slides, and gave rise to an instructive discussion, after which a vote of thanks was unanimously accorded Mr. Pearce.

Catalogue Received

Copper, Bronze and Brass Welding. Murex Welding Processes, Limited, Waltham Cross, Herts, has sent us an eight-page booklet, which describes and illustrates the process of welding heavy non-ferrous components by the electric arc process, using "bronze" electrodes, of which there are three types. The reviewer cannot commend as a model of good publicity the illustration of a "perfect fusion" made by a product of an issuing house and its contrast with a picture of an extremely poor fusion made by a competitor's material. It would need but little stretch of the imagination to envisage conditions which would reverse the pictures. Beyond this criticism of policy, it can be stated that the booklet is both useful and interesting to those engaged in the heavy non-ferrous industries, including the foundryman.

Random Shots

Trust a Yorkshireman not to be beaten!

The maker of the very tiny boot protectors mentioned in this column a week or two ago has taken up the challenge from the South to produce a still smaller casting than the "full stop" used for magnetic trade-signs. He threatens to cast a rivet for a lady's wrist watch. He would like everyone to believe that he is really making them, but in this case "Marksman" at least will believe it when he sees it being done!

* * *

The Editor is thinking of asking the Foreign Office to send a "strong note of protest" to Japan. He has just had returned from that country a collection of recent copies of the "F.T.J." Not that there is anything to worry about in that, for there is always a brisk demand for back numbers over here, and, anyway, there was a very acceptable postage stamp to add to his collection; but some Japanese Jackanapes had actually stamped across the parcel "Fourth Class Matter"!

* * *

What is metallurgy coming to? Elsewhere in this issue is a notice of the publication of an American Bulletin (a booklet of 115 pages, mark you) dealing exclusively with the entropies of inorganic substances. Realising vaguely that it had something to do with calculation, "Marksman" sought further enlightenment from a colleague (who suffers from mathematitis in its most advanced stage). "Entropy" said he "is a fundamental thermo-dynamical concept of the energy levels in a system. Together with the free-energy of the system, it determines whether specific reactions can or cannot occur under specified conditions. It is not susceptible to direct quantitative measurement, but derivable from various physical data, such as the Debye and Einstein specific-heat and free-energy functions, and electronic and nuclear data. The more you study entropy, the more complex and confusing it becomes, but you have the satisfaction of knowing that the entropy of the universe is continually increasing." Quate! but for the benefit of the metallurgist who prides himself on being a practical man rather than a laboratory Johnnie, the following explanation taken from the Oxford dictionary should make the meaning of the word quite clear to him. "Entropy: the name given to one of the quantitative elements which determine the thermo-dynamic condition of a portion of matter." The Oxford dictionary always likes to substantiate its evidence, and accordingly gives the following quotation:

"A portion of matter at uniform temperature retains its entropy unchanged so long as no heat passes to or from it, but if it receives a quantity of heat without change of temperature, the entropy is increased by an amount equal to the ratio of the mechanical equivalent of the quantity of the heat to the absolute measure of the temperature on the thermo-dynamic scale. The entropy of a system is always increased by any transport of heat within the system; hence the entropy of the universe tends to a maximum (Clausius)."

* * *

Nil desperandum. Possibly, like the following sentence, it only needs a little more punctuation to make sense of it:—

John where Dick had had had had had had had had had had had the approval of the teacher.

Puzzle that out the next time you are on fire duty!

"MARKSMAN."

Fuels and Furnaces for the Heat Treatment of Steel Castings

By T. R. WALKER, M.A., F.I.C. and F. SMITH, Assoc. F.

(*Concluded from page* 306.)

Electric heating of heat-treatment furnaces has many advantages. Little auxiliary equipment is necessary, automatic control of furnace temperature is easy, and as the furnace chamber can be kept closed any type of atmosphere can be used, as desired. The labour cost is low, and it is easy to keep the plant and shop clean. No handling facilities are required for fuel, ashes or waste gases. A furnace can be put down anywhere where there is a sufficient supply of electric energy, and can easily be moved from one shop to another if required.

The capital cost of such furnaces and equipment is high, however, and the energy cost per B.Th.U. is also high in this country. Most electric furnaces are slow in reaching a high temperature from the cold, and the energy cost is considerably increased if the furnaces work intermittently. This is partly on account of heat losses and partly on account of the service charge, if the current is taken from a supply company. The cost of heating elements is somewhat high, but if newer types are used, such for example, as the hairpin design, burnt out elements can be replaced without arresting the operation of the furnace.

Choice of Type of Fuel

If a new furnace installation be under consideration, the first point to be determined is the nature of the heating medium. From a consideration of factors such as have been referred to above, some fuels can be eliminated at once. Frequently, the choice of fuel for the new furnaces is obvious when, for example it is merely an extension in the use of a fuel already provided, as may be the case when a new furnace can be served by an existing gas-producer plant. The type of furnace is next decided from a knowledge of the operations to be carried out, and of the facilities available in the shop. The purpose of the heating, such as for annealing, tempering or hardening, with a figure for the maximum temperature to be reached, must be known. Other information required includes the period of the heating cycle, with the length of time each furnace will work each day, and particulars of the material to be heated; for example the range of dimensions including thickness, and number to be heated at one time.

These details, and the method of handling the articles during charging and discharging, influence the selection of size, shape and type of furnace. The provision of recuperators, regenerators, or even of waste-heat boilers, is governed by the circumstances of each particular case.

The facilities available include the floor area and height which can be utilised; the presence and nature of overhead cranes; electric, steam and water supplies, and the space which can be spared for stocking fuel, if this is of a type which can be stored. One factor important in every aspect of the installation is the availability of suitable labour, since, if this is scarce or expensive, it is worth while to increase the capital cost by providing labour-saving mechanisms wherever possible.

When information such as the above has been obtained, the officials responsible for the new plant can approach furnace builders for detailed designs and estimates. Large organisations, with engineering and technical departments, often design their own furnaces, which are then built either by outside contractors or by the company's own building department. Frequently, there is a tendency to duplicate a furnace in some other works, which has proved successful for similar duties, without sufficient allowance being made for the differences in conditions between the two shops, which nearly always exist.

Heat-Treatment Furnaces

In any discussion of heat-treatment furnaces it is well perhaps to point out that furnaces used for treating steel castings are precisely similar to those used for heat-treating steel articles produced by other processes, such as rolling, forging or drop stamping. Some of the furnaces referred to below are used for the heat-treatment of steel castings, some deal with either forgings or castings according to circumstances, whilst others, used perhaps for drop forgings, could just as easily be used for heat-treating steel castings of suitable size and shape. The processes used in the heat-treatment of steel castings vary with the composition of the steel, and include annealing, normalising, quenching and tempering, but it is not proposed to discuss in the present Paper any aspects of heat-treatment as such.

Very large heat-treatment furnaces are usually heated by raw producer gas. In the main this is due to economic considerations, but is also influenced by the fact that manufacturers of the largest type of steel casting generally have plenty of producer capacity available, and an extensive experience in their operation. For these very large furnaces the fuel cost of town's or coke-oven gas is usually prohibitive. At the same time, for one such furnace in a batch it is worth while considering modifications to enable it to be worked by town's gas as an alternative to raw producer gas. This provision enables the single furnace to be operated when the amount of work to be done is small. It often proves more economical than maintaining the producers in operation, and keeping all the flues full of gas which is almost stationary, and fouls the flues more quickly than when all the furnaces are working.

Such an arrangement is in operation in one of the large steelworks, and is applied to a heat-treatment furnace having a hearth 14½ ft. wide and 40 ft. long. This furnace is equipped with regenerators and is normally fired by producer gas. The change-over to firing by town's gas is simple and takes only a few minutes. When the furnace was first put into commission, some difficulties were experienced owing to the wide difference in calorific value of the two gases, and also owing to the deposition of suspended matter by the producer gas. Whilst the furnace was working on town's gas, tarry matter was deposited at the valves, shutting off the producer gas, causing trouble when, later, it was desired to revert to producer-gas firing. The carrying out of minor modifications, however, quickly removed these difficulties.

If cold, clean producer gas is the normal fuel, the utilisation of town's gas as an alternative is easier, since there is little deposition of suspended matter from either gas, but there are still difficulties owing to the great difference between the calorific values of the two gases. It is comparatively easy, however, to work furnaces on a mixture of clean producer gas and town gas having a calorific value between 300 and 400 B.Th.U. per cub. ft., so long as there is an efficient pressure controller which can be altered according to the calorific value of the gas being used. In such cases it is essential to control accurately the flow of each gas into the mixing length of main, and for this mixing main to be long enough to ensure that the issuing gas is uniform in composition before it reaches any of the furnaces.

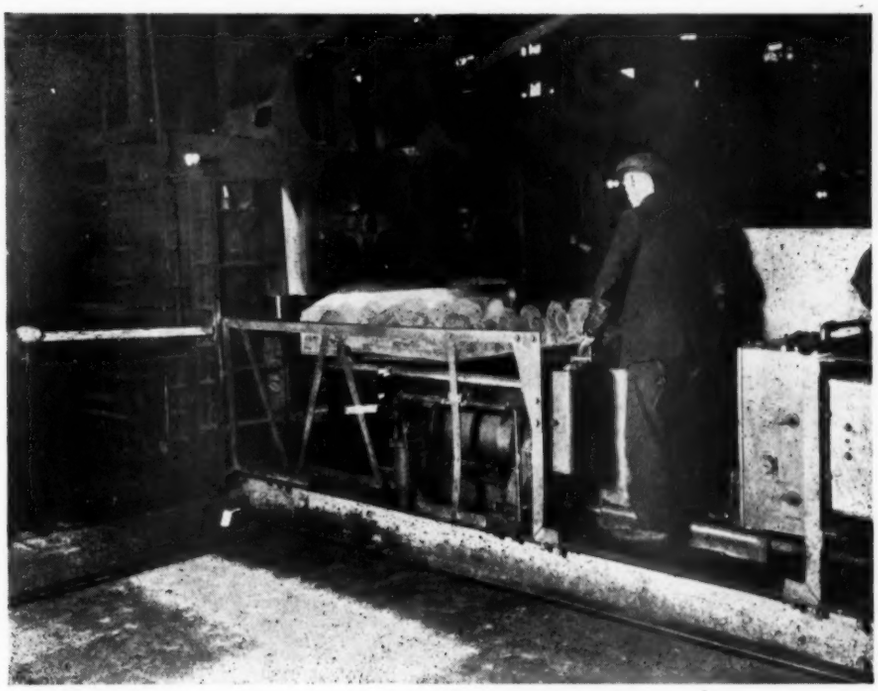


FIG. 5.—CHARGING MACHINE UNLOADING FURNACE.

Batch-Type Regenerative Furnaces

The large furnaces now being considered are nearly always intermittent, or batch-type furnaces, with regenerators below the hearth, and the stock is usually allowed to cool down to a

Heat Treatment of Steel Castings

safe temperature in the furnace. The car-bogie type of hearth, which offers the easiest means of handling large castings and forgings, is the type usually adopted. One of these furnaces, fitted with a type of bogie and track which has proved very successful, is illustrated in Fig. 1. The bogie is carried on three rail sections at each side, these resting on grooved rollers, which are always cold, and can be lubricated or serviced conveniently at any time. With large castings it is important to have plenty of free furnace space available, since the rate of heating of the stock is governed by the rate at which heat can be transmitted from the outer layers of the material to the centre. If some part of the stock is near enough to the gas flame for pronounced local heating to occur, then the object of the heat-treatment is defeated.

The transfer of heat by radiation does not begin until a temperature of about 500 deg. C. is reached, and the heating of stock up to 650 to 700 deg. C. is carried out almost entirely by convection. It is thus necessary to pay attention to the circulation of the products of combustion in heat-treatment furnaces, and in this connection an appreciation of the duties of the stack damper is important. Where the heating medium enters the furnace by virtue of its own energy, as in the case of gas, the only function of the stack is to remove the products of combustion from the furnace, and the height of the stack is immaterial. The stack must, however, be carried through the roof and sufficiently high above surrounding buildings to prevent stack gases from blowing down into the shops. This provision makes the stack unnecessarily high from the furnace point of view, and more draft is set up than is required. The stack damper should, therefore, be used intelligently to counteract the excessive draft so as to maintain in the furnace chamber a pressure equal to, or slightly above, that of the outside atmosphere.

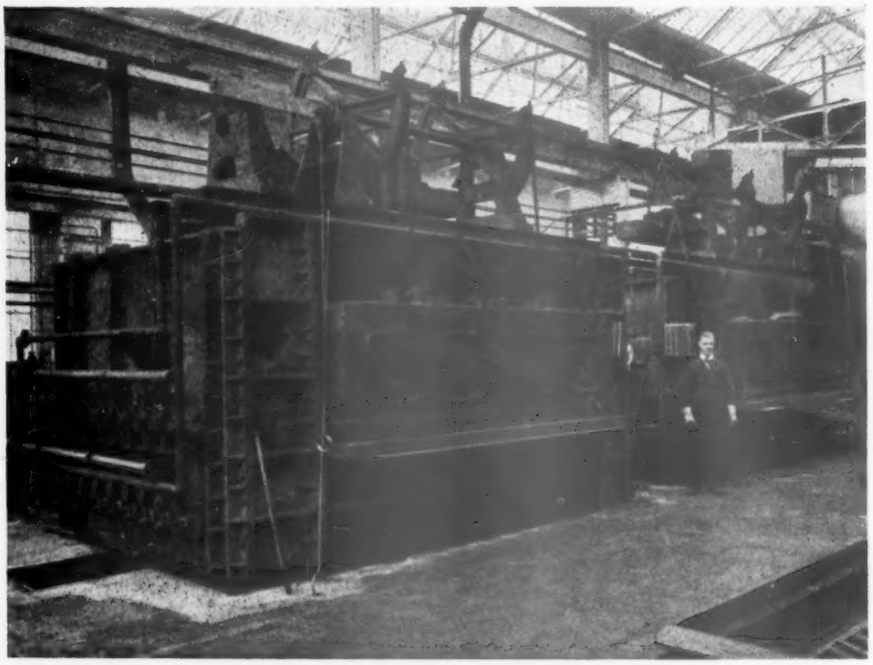


FIG. 6.—TOWN'S GAS FIRED FURNACE BEFORE FITTING COKE PRODUCER.

Furnaces for Medium Size Stock

For rather smaller stock, which still however requires car bogies for convenience in handling, producer gas is still the most widely used fuel, but town's gas and, to a smaller extent, oil and pulverised fuel, begin to make their appearance. During wartime, however, it is most unlikely that for heat-treatment purposes, oil heating will make further progress. With this type of work efforts are frequently made to speed up the output and at the same time economise in fuel, by eliminating the necessity for allowing the castings to cool down in the heating chamber. These advantages are secured by building the furnace in several sections, each section being separated from its neighbour by a door, and holding one or more car bogies which can be pushed right through the furnace. A typical example of this type is the three-chambered furnace in which the first chamber is used for preheating, the second one for soaking at temperature, and the third one for cooling. Waste gases from the centre chamber are usually used for preheating the castings in the first chamber, but alternatively they may be used in the third chamber to retard the cooling of the castings, if necessary. For castings which are smaller and more or less uniform in size, the number of chambers can be increased to any desired extent until a continuous cycle is reached, occupying a selected number of hours to complete. In such furnaces it is usual for all doors to be interconnected so that they are all lifted at the same time, to allow the movement of the bogies.

Heat-Treating Small Components

As the size of furnace is further reduced, the utilisation of continuous-operating mechanisms becomes easier, and both town's gas and electricity are more extensively used as the heating medium. The stock is lighter in weight and thinner in section, so that the heat reaches the centre of the stock more rapidly, and larger throughputs can be obtained. Mechanised furnaces in this range have made rapid progress during the last few years, fitted with a variety of equipment, including pusher types, chain conveyors, rocker bar and walking beam conveyors, helical or monorail conveyors, and many others. Each type has its own advantages, but it is not proposed to discuss these in the present Paper. The increasing application of such mechanisms to obtain rapid, effective, and consistent heat-treatment is partly due to the production of new and more efficient heat-resisting steels.

The continuous furnace is not superseding the batch type completely, since one of the most popular types of furnace, even for small work, is a batch type with an adjacent cooling chamber. In this type, which may be heated by means of town's gas or electricity, the stock is loaded on to trays, and after heating the completed trays are pushed through the back of the furnace into a cooling chamber, which is separated from the main furnace chamber by a gas-tight door. The heating chamber is then recharged and the cooled trays withdrawn after the appropriate cooling period. Alternatively, an arrangement may be fitted for dropping the castings into a quenching tank directly from the cooling chamber, so that there is no opportunity for the castings to cool, and they do not come into contact with the outside air for an appreciable length of time.

A simple example of such a furnace with one chamber only is illustrated in Fig. 2. This furnace is fired by town's gas, and immediately in front of it is a quenching tank which may contain either water or oil. In the illustration, the furnace is being loaded with wheel centres. An inclined apron is fitted to the front of the furnace, and when the castings are ready each is pulled forward in turn until it falls down the apron into the tank. A similar furnace is seen alongside with the apron supported in a horizontal position, which is frequently convenient for charging purposes.

In works with a large regular output of small to medium weight castings or forgings, excellent results may be secured from a battery of heat-treatment furnaces with charging and discharging equipment which serves all the furnaces. An example is illustrated in Figs. 3, 4 and 5. The battery of furnaces concerned is heated by town's gas, the temperature being controlled automatically. As seen in Fig. 3, the furnace hearth is formed as a series of piers running the whole length of the furnace. A charging and discharging machine, illustrated in Fig. 4, runs on a wide-gauge track in front of the row of furnaces, and carries a series of prongs which can be extended into any furnace, and fit in between the piers, thus enabling stock to be charged or withdrawn. Fig. 5 shows the charger withdrawing the stock from a furnace. Between the furnaces are quenching tanks, and the stock withdrawn from the furnaces can be placed in trays, which are then lowered below the surface of the oil.

Similar equipment in a variety of designs is now in use in many works, serving batteries of furnaces heated either by town's gas or by electricity, both of which lend themselves to accurate temperature control and the performance of very regular time cycles in heat treatment.

Semi-Portable Producers

The advisability of being able to replace town's gas by some other gas at short notice has already been mentioned. One method of ensuring this is to use small semi-portable producers burning coke as a fuel, giving clean coke-producer gas which does not readily clog the pipes or burners normally carrying the town's gas.

Several types of such producers are now being manufactured, the cross section of one type being illustrated in Fig. 7. This producer is a modification of one developed by Mr. A. G. Hales, of the Coal Utilisation Research Association, for use in propelling vehicles.

Two of these producers have been installed to heat a furnace of the type shown in Fig. 6, having two rows of eight town's gas burners, one along each side of the furnace.

Referring to Fig. 7, the producer consists of a hopper (1) at the base of which is attached a fuel-feeding cone (2), which also forms the gas outlet (15). This cone allows the fuel to flow through an annular gap between it and the

Heat Treatment of Steel Castings

producer wall, thereby causing segregation of the fuel to take place, so that the smaller fuel remains at the side of the producer and forms a protective layer, whilst the larger fuel flows towards the centre and ensures a path of low resistance for the combustion gases. A poking hole (3) is provided at the base of the hopper.

The producer proper consists of a double-walled chamber, lined inside with fireclay cement (4), at the base of which is a heat-resisting iron ring (6). Below this ring is an ashpit (9) with an adjustable sleeve (10) to facilitate the removal of ashes at the end of a run. The iron plate (12), which supports the fuel bed, has four radial ribs on its upper surface, and when the plate is rotated by means of the external handle (13), these ribs crush the ashes against the fixed blades (11), thereby making it possible

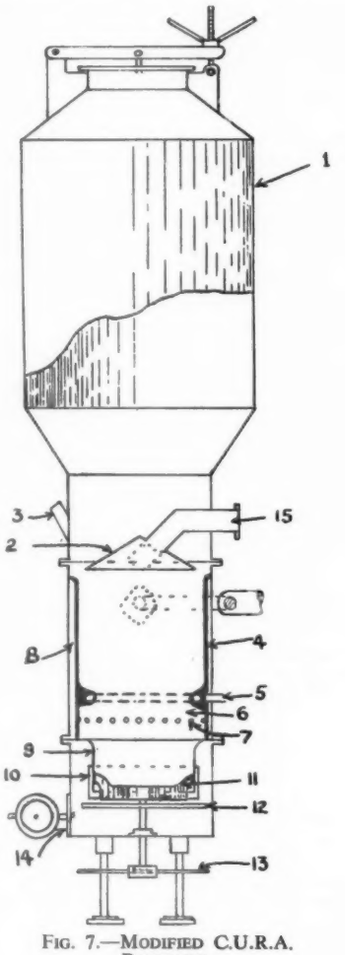


FIG. 7.—MODIFIED C.U.R.A. PRODUCER.

to remove all the ashes through the ash door (14).

The preheated blast enters the peripheral jacket (8), and passes through holes (7) drilled in the ring (6) to the gas chamber proper. A water-cooled ring (5) is situated just above the holes at the point of highest temperature.

The complete equipment for one producer is shown diagrammatically in Fig. 8. An electrically-driven booster provides air under pressure for the blast. The pressure and quantity of air supplied are regulated by the air by-pass, which provides a bleeder for any excess air. The blast air is heated in the preheater, through which the producer gas passes on its way from the producer. The steam for the blast enters the preheater as water, is vaporised, and the steam mixed with the incoming air. The air and steam enter the producer, pass through the fuel bed, and the producer gas is carried through the preheater to a dust separator, where any fine particles of coke or ash are arrested, so that clean gas passes on to the furnace. Gauges are fitted to the blast pipe and delivery pipe so that the blast pressure and gas pressure can be observed.

In starting up, an oxy-acetylene or similar burner is placed in the coke hole (3), the blast turned on, and the gas by-pass opened so that the gases escape to atmosphere until the producer is in full operation. This gas by-pass should be carried outside the shop so that the shop atmosphere is not contaminated with carbon monoxide. As soon as good gas is being obtained the gas by-pass is closed, and the producer gas lighted at the burners.

The following has been found to be the approximate range of chemical analysis and calorific value of the gas:—Carbon monoxide, 28 to 32 per cent.; hydrogen, 8 to 12 per cent.; carbon dioxide, 2 to 5 per cent.; oxygen, 0 to 0.5 per cent.; nitrogen, 52 to 58 per cent.; calorific value, 140 to 150 B.Th.U. per cub. ft. Since the producers are alongside the furnace, the gas contains some sensible heat which is not included in the above calorific value.

The quantity of gas and to some extent the quality depend on the conditions of operation, but an approximate figure for a producer of 20 in. dia. would be an hourly output of four therms, equivalent to about 2,700 cub. ft. per hr. of gas at an assumed average calorific value of 145 B.Th.U. per cub. ft. The normal heat consumption of a furnace when using town's gas can be calculated from the calorific value and the volume used per hour, and to replace it by coke-producer gas requires approximately the same total heat value in the producer gas. As the calorific value of the producer gas is less than one-third that of town gas, the volume of producer gas supplied to the furnace must be increased accordingly, so that the gas pressure required is substantially greater than when town's gas is being supplied.

The gas burners must be examined to make sure that there are no local constrictions which would interfere with the passage of the increased amount of producer gas at the higher pressure. The amount of air required for complete combustion by producer gas is much less than that required by the same volume of town's gas, and burners must be adjusted accordingly, but this operation is usually very easy.

The operation of these producers is influenced considerably by the quality and size of the coke, and to obtain the best results a graded coke must be used, such as one containing only pieces between ¼ in. and 1¼ in. in size.

From the above brief survey, it may be concluded that during recent years the design of heat-treatment furnaces and their associated equipment has made considerable progress, particularly in furnaces intended for the heat-treatment of small or medium weight castings and similar articles. There is a reasonably wide choice of fuels, even in wartime, and the total cessation of work if the fuel normally used becomes unavailable can be avoided by intelligent anticipation. The importance of heat-treatment as a process in the manufacture of steel castings is being realised by an increasing number of foundries, especially where new specification requirements must be met. Whilst the object of heat-treatment is to put a casting into the physical condition required, the cost of the operation must not be overlooked. This is greatly influenced by the intelligence shown in the planning of the operations, and subsequently by the skill of the furnace operators. Devices such as are employed for controlling furnace atmospheres and temperatures are extremely useful, especially when they are maintained in proper working order, but there is sometimes a tendency to rely on them too much, both by the management and by the furnace operators.

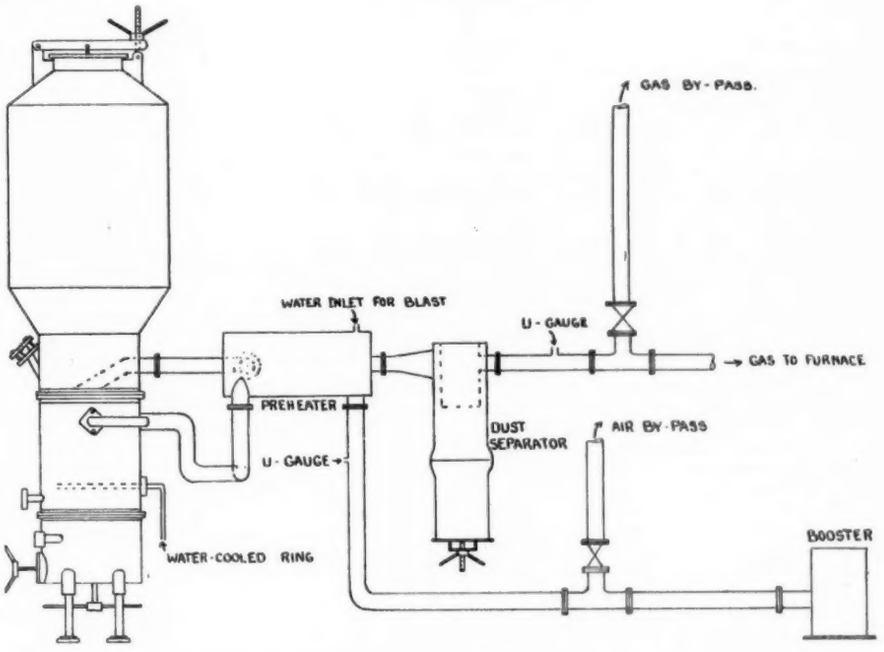


FIG. 8.—DIAGRAMMATIC ARRANGEMENT OF PRODUCER AND ACCESSORIES.

The authors wish to thank the Directors of the English Steel Corporation, Limited, for permission to publish this Paper, which is largely based on experience obtained in the various works of the Corporation.

U.S. Aluminium Capacity

Mr. Jesse Jones, the Secretary of Commerce and Federal Loan Administrator, recently announced that the Defence Plant Corporation is financing an additional production of 30,000 short tons of aluminium and 112,000 short tons of magnesium. The total aluminium capacity of the United States will then be raised to 1,130,000 tons.

The British Cast Iron Research Association

TWENTIETH ANNUAL REPORT FOR THE YEAR 1940-41

As the Association has been heavily engaged on work arising directly out of the war, this report for the year ending June 30, 1941, is necessarily couched only in the most general terms, and the disclosure of fuller details must be deferred.

Council and Officers

The annual general meeting was held in Birmingham on October 30, 1940. The report and accounts were unanimously adopted and the proceedings were fully reported in the "Bulletin" for January, 1941. The Department of Scientific and Industrial Research has nominated as its representatives to the Council Sir Harold Hartley, C.B.E., M.C., F.R.S., Past-President, and Sir Lawrence Bragg, F.R.S., to succeed the late Sir Robert Hadfield and the late Sir Harold Carpenter. Dr. C. Sykes has also been nominated by the Department to represent the National Physical Laboratory. The Council unanimously re-elected Dr. H. Hartley as chairman, and five meetings have been held, together with four meetings of the Research Committee, of which Dr. J. E. Hurst was re-elected chairman. Mr. T. M. Herbert, M.A., has also continued as chairman of the Publications Committee. The Executive Committee appointed by the Council last year has held eleven meetings during the year, in addition to five since the end of June. Ten meetings of the Anti-Glare Committee have been held. The total number of meetings held is thirty-six, substantially less than the normal peacetime figure. The membership of the Council and Committees, usually given as an appendix to this report, is substantially unchanged. Following the retirement of Mr. J. T. Goodwin, M.B.E., who served the Association in various capacities for many years since its inception, the Council has unanimously recommended that he be elected an honorary member.

The industry and the Association alike have suffered a number of grievous losses during the year. The death of Lord Austin of Longbridge deprived the industry of a great leader and the Association of its President. His long and distinguished career evoked many tributes. Further losses were sustained by the death of Mr. J. B. Allan, M.A., who was vice-chairman of Council, and of Mr. S. E. Dawson, who was chairman of the Grey Iron Sub-Committee.

Mr. P. Pritchard, Vice-President, was awarded the E. J. Fox Medal of the Institute of British Foundrymen, and Mr. J. J. Sheehan the Oliver Stubbs Medal by the same body in July, 1941.

Research and Development

The work of the Association is almost wholly directed to assisting the war effort, and activity throughout the year has been maintained at a high level.

The national situation calls for the fullest use of native iron ores, the most readily accessible of which are phosphoric, and this has resulted in three lines of approach to the more extended use in ironfounding of phosphoric iron. The first is the increased production and more extended use of refined irons made in part from phosphoric material. The second is the use of cast irons of phosphorus contents to the highest limits set by considerations of mechanical strength and soundness. The Association had in its earlier work already covered part of this ground, and it was completed and a report issued on plain cast irons containing phosphorus through the Institution of Mechanical Engineers Research Committee on High Duty Cast Irons for General Engineering Purposes. This report indicates the extent to which phosphorus can be used in irons required to comply with given national specifications. The same Committee has issued another report, prepared by the Association, on special duty (austenitic and martensitic) cast irons for the information of engineers and designers. A further report is in preparation on phosphoric alloyed high-duty cast irons, in addition to a report on alloyed cast irons in general.

The third line of approach consists in the dephosphorisation of phosphoric pig and scrap. The basic steel process, as is well known, removes phosphorus from ferrous material, but only after the loss of silicon, manganese and carbon present. The problem of removing phosphorus without eliminating carbon offers considerable technical difficulties, and much experimental work has been done during the year and a report has been prepared. A great measure of success has been achieved on the necessarily small-scale trials, and the subject is now at the stage of justifying practical manufacturing scale trials. The results show that phosphorus can be removed with comparatively slight reduction in carbon content. There is an accompanying slight loss of manganese and a considerable loss of silicon, the addition of which to dephosphorised metal would have to be made. Further developments depend upon the general situation. Trials have also been made of methods stated to dephosphorise, and have been shown to be either unsuccessful or commercially impracticable.

For the time being, the work done on cast irons containing very fine graphite structure has been postponed, but a group of reports has been prepared recording the stage reached, so that the subject can be taken up again at some future date. The possibilities of obtaining the fine graphite iron from the cupola are now much greater than they were, due to an increased understanding of the factors governing graphite formation.

Work on the determination of non-metallic inclusions in pig and cast iron has been continued. From the chemical side, three reports were presented by the Association to the Oxygen Sub-Committee, and were included in the Third Report to the May meeting of the Iron and Steel Institute. The methods evolved for use with pig and cast iron are now in final form, and are being applied to a representative series of British pig-irons. From the microscopic standpoint, two reports were presented to the same meeting on the metallography of inclusions in pig and cast irons and on methods of preparing samples for examination. These Papers were chosen for, and evoked, an excellent public discussion. Work on the properties of ingot mould material at ordinary and elevated temperatures continues, and the work carried out to extend the life of ingot moulds is of great service under present conditions.

The staff and laboratory concerned with moulding sands have been very fully engaged, since sand problems are as a rule prominent when new products are being made. Experimental work has continued on the reclamation of oil-bonded core sands and on substitutes for imported clays. Work is also in progress on foundry materials derived hitherto in the first place from imported food products.

The Joint Committee on Vitreous Enamelling (B.C.I.R.A.—I.V.E.), of which Mr. W. Todd is chairman, has held two meetings, in addition to meetings of sub-committees. An acid resistance test for finished enamelware has been devised and reported, and work has been begun on a test for the measurement of adhesion. Work on opacifiers in connection with the Tin Research Institute has been continued, and a first report is in preparation.

For a large part of the year, work on anti-glare continued at high pressure. As explained in the last report, the Anti-Glare Committee, of which the director is chairman, works in conjunction with the Ministry of Home Security for the purpose of assisting both the industry and the authorities in matters arising out of the defence regulations. The shortening of the black-out period, combined with the adoption of double summer time, greatly simplified the screening problem for many foundries, but in spite of this the Committee has approved of between 300 and 400 schemes. The number and variety of cases to be considered placed considerable strain on the staff concerned.

Development Department and Laboratories

The demands of the war have been reflected in a great increase in the work both of this department and in the laboratories which serve both the research and development sides. The sands and refractories and microscopic laboratories both show increased output, while in the case of the chemical laboratory an increase of one-third, and in the mechanical testing laboratory an increase of one-fifth over the previous year is shown in the number of tests and determinations made. The last two mentioned laboratories have a load approximately twice as great as in 1939. The Scottish laboratory (Mr. T. Tyrie, B.Sc., superintendent) fully shared in these increases.

Library and Information Bureau

Considerable difficulty has been experienced in regularly obtaining certain foreign periodicals, but in spite of this the library service has proved particularly valuable under present conditions. The number of accessions and loans and of inquiries to the Information Bureau is only slightly below the previous year.

War Work

The items of the research programme concerned with the war effort have been mentioned above. The development department and the laboratories have been and are daily in contact with members on the technical aspects of the production of all components required in cast ferrous metal. Advice on the wider use of cast iron is constantly sought by and given to the official departments concerned, and advice sought and given on matters arising out of raw material supplies have greatly minimised the difficulties incidental to the present conditions under which the industry is working.

The Association has been registered by the Ministry of Labour and National Service as a protected establishment. The director has continued to act as a member of the Technical Panel to the Director of Iron Castings, and Mr. W. B. Parkes is secretary to the Sub-Committee on Foundry Bonding Materials. Mr. L. W. Bolton is secretary to the Anti-Glare Committee. Mr. A. A. Timmings is engaged fully on work for the Iron and Steel Control at headquarters, while Mr. A. J. N. Smith acts in liaison with the Association at the Directorate of Scientific Research of the Ministry of Supply.

Staff and Staff Training

Two more members of the junior staff have joined the Forces. The whole of the staff not engaged in voluntary part-time civil defence activities take regular fire-watching duties at headquarters and at Falkirk, and the equipment is fully insured under the War Damage Act. Several university students were received during the vacation and a number of representatives of members have for shorter or longer periods visited the laboratories to practise the techniques

(*Continued on page* 320.)

Modern Trends in Foundry Practice

Discussion of Mr. V. C. FAULKNER'S informal address to the London Branch of the Institute of British Foundrymen

Mr. V. C. Faulkner's talk* on "Modern Trends in Foundry Practice," given to the London Branch of the Institute of British Foundrymen, gave rise to a discussion on a very wide variety of topics. The discussion was opened by the BRANCH-PRESIDENT (Mr. R. B. Templeton), who said the sand problem was a very serious one from the point of view of the London foundries, because the sands they used had to be transported considerable distances, *e.g.*, from the Midlands or from Erith, and so on, and they had to pay four or five times as much for sands as had the Midland foundries, into whose yards they could be carted for probably 3s. 6d. or 4s. per ton. Recently he had been trying to find a good method of reclaiming sands; figures he had obtained showed that some 1,500 tons of sand per annum came into the foundry, and eventually 1,500 tons of rubbish went out, and he estimated that about 75 per cent. of that was waste sand. That was very expensive, and research into that particular problem would be of very great value to London founders. He was aware, of course, that work was proceeding in that direction.

Sand-Testing Apparatus Control

An inspection of some sand-testing apparatus in the foundries would suggest sometimes that it had not been used for perhaps three or four months. That, however, was a matter for the management, for it was not of much use having such apparatus if it were not applied. In a fairly highly mechanised foundry, of course, it was very much easier to maintain the ideal sand conditions than it was in a jobbing foundry. In the latter it was more difficult to keep correct records of the strength and bond and permeability of the sands.

The shape of iron pigs was another important matter, because foundries had to stock fairly large quantities, and some shapes were very difficult to stack. It was important that the pig-iron makers should consider the matter and, indeed, some improvement was being effected.

MR. ARNOLD WILSON commented that he had been instrumental in effecting an alteration in the shape of certain pigs.

Remelting Swarf

The BRANCH-PRESIDENT, expressing his interest also in the problem of the reclamation of swarf, said that on some occasions he had thrown swarf into a mould half filled with molten metal. But on one occasion there had been an explosion, due to the swarf being wet, and one had to bear in mind that element of danger. To put it on at the end of the blow was one way of getting rid of it; it was good policy to charge all the skimmings and chippings into the cupola at the end of the blow.

Commenting on Mr. Faulkner's reference to the use of water and sand blast for cleaning castings, Mr. Templeton said that he did not know of a plant in this country in which such an equipment was used. Recently he had installed a centrifugal chilled grit cleaning machine, and had found that the results represented a worth-while improvement over those of shot blasting by compressed air, not only in respect of output, but also in the finish of the castings. The output of the machine was extraordinary.

Sectional Thickness Control

The electrical method of determining the thicknesses of the walls of castings was well worth consideration, because some castings, especially those which were intricately cored, such as cylinders or cylinder heads, might give rise to anxiety, for the misplacement of the cores might result in one wall being very much thinner than another, probably so thin that it would not withstand any internal pressure at all. The electrical method of determining wall thicknesses was not very expensive, and it seemed to him that it should be used in any up-to-date foundry making castings of the kind he had mentioned.

Expressing gratitude to Mr. Faulkner for his interesting review of foundry developments, he emphasised that it was of intense practical interest to both iron and non-ferrous founders; such reviews should be encouraged in every way.

Mechanically Cast Pig-iron

MR. E. M. CURRY, emphasising that an address such as that given by Mr. Faulkner was a very real help, said it was all the more valuable because the temporary abandonment of the Foundry Trades Exhibition, owing to war conditions, had left a gap in one's knowledge of new equipment; further, a good many of the technical and scientific bodies were more or less hibernating, and consequently were not putting forward so many thoughts and ideas on which one could build. He suggested that the Branch-President and Council might persuade Mr. Faulkner to give such an address annually!

Discussing the problem of the shape of iron pigs, he suggested that from the foundry point of view it was more important to have a clean, well-shaped pig for melting than to pay too much attention to facility of stacking; if it could be pitched off the wagons into heaps and then carried away for melting, one should not have to waste too much time stacking it. An intense study of the shape of pig-iron was being made by quite a number of people; some three or four different patents had been taken out regarding the shape of pig-iron, especially the chill cast pig, for various reasons. He was interested particularly from the point of view of fast melting.

Too Much Control

Without wishing to be involved in a discussion on modern developments in cupola practice, he suggested, apropos the new system which Mr. Faulkner had mentioned, that some foundries appeared to be becoming over-burdened with methods of testing sands, cupolas and various other things, and he urged that a great deal was to be gained by getting right back to first principles. In considering the various methods that were advocated, it was surprising how much one could re-learn. For example, year by year quite a number of new ideas were put forward concerning cupola operation. Some time ago he had been astonished to find how much improvement could be effected as the result of placing an anemometer at each of the tuyeres of an ordinary straight-shaft cupola. After all, if the air did not enter the cupola evenly, how could one expect to achieve equal melting conditions and uniform consistency of product at the bottom? That was the basis of the success of the modern high-test irons. There was no doubt that, given a good straight-shaft cupola, properly lined, into which the air was flowing equally through each tuyere, and ensuring that the volume was correct and that the charging was also correct, then the modern developments of ladle inoculation and ladle metallurgy had a fair chance of success from the very start.

Remelting Borings

There was a great deal in the problem of the remelting of borings, and if the equipment for and the knowledge of that remelting were more widespread we should achieve truly remarkable results with material which was generally condemned. For example, he had in mind an Italian foundry which was able to produce cast iron having a tensile strength of 35 tons per sq. in. in the as-cast condition, and 50 tons per sq. in. after heat-treatment, practically from borings alone. It was using the canister method; in point of fact, the borings were rammed into sardine tins, and by remelting there was produced what might be termed a high-carbon steel pig. So that, instead of having to contend with the many variables regarding carbon pick-up, and so on, arising from the melting of different types of steel, the foundry in question had started with a high-carbon white iron (for it could be described as such), so that there was greater consistency of melting and uniformity of product.

No New Thickness Control Necessary!

At the risk of being considered a little antagonistic towards some of the so-called new ideas in connection with the testing of castings and many other problems mentioned, he suggested that there was still a great deal of advantage to be gained by careful working in the foundry rather than by placing too much reliance upon new-fangled methods of control. For instance, the method for determining electrically the thicknesses of the walls of castings was of great interest; but from the practical point of view it would not be easy to apply that to every casting in the shop. The moulder had a remedy in his own hands if he used gauges when inserting cores; that was a reliable method of producing sound castings of even thickness. Literally hundreds of new methods were being offered to foundrymen; but one should give them extremely careful thought in order to determine their true value.

Ladle Metallurgy

MR. J. F. KAYSER commented that he did not think there was any real objection to ladle metallurgy, but it might have gained a bad name in the past as the result of adding products which were not uniform. It had been customary in the steel trade many years ago to kill steel by retaining it in crucibles for a considerable length of time. That system was followed by the practices of what might be called the "aluminium school." Then, 30 or 40 years ago, the effects of manganese, silicon and aluminium became better understood, and it came to be known that one could prevent the steel "blowing" out of the mould by adding one or all of those elements to the steel. Then some founders had put any sort of rubbish into large furnaces and had remelted it, poured it into a ladle, and had thrown in aluminium or silicon or manganese, or alloys consisting of all three elements, until the steel had "appeared" to be satisfactory. Steel made in that way, however, might have any sort of property; it might be of little use, or it might be quite good. The important point in all melting processes, surely, was to put into the ladle a uniform product.

If using a Siemens furnace, one must work the slag, etc., so that there was equilibrium in the steel, and then put the steel into the ladle; then he did not think there was any objection to the use of an alloy, or the application of an electrode as in the experiments mentioned by Mr. Faulkner. If those experiments had been carried a little further than in fact they were, the results would probably have been even more interesting. At the moment there was an upper limitation of melting capacity in so far as high-frequency induction furnaces were concerned. One could melt on a large scale, such as 60 tons; and if one tapped off the metal and just

* See Foundry Trade Journal, Oct. 30, 1941.

Modern Trends in Foundry Practice

maintained the temperature for about 30 min., the composition was not altered, so far as could be determined, but the product was much improved. That was distinctly analogous to the process with which Lord Chetwynd had experimented many years ago, although in those experiments an electrode was used on the top.

Castings from Turnings

With regard to the use of turnings, Mr. Kayser recalled that just over 20 years ago he had worked for some months with a Swiss firm engaged in the making of textile machinery, and the only metal they had bought had consisted of turnings; they had insisted on using free-cutting steel turnings, of which there was a big supply in Switzerland, and they had made all their cast iron from that material. They had installed a Brown-Boveri furnace and used three electrodes, about 30 in. square, which had completely filled the hearth. It was operated on the Héroult system, three-phase. No additions at all were made to the mixture of turnings and coke, but they did control the amount of coke used and the period during which the metal was maintained in the furnace. When tapping, they drew the electrodes right out and just tilted and tapped over the spout. Their results were from 10 to 15 per cent. better than were obtained when using the best pig-iron. The material was close-grained, it had no hard skin, and it did not chill in the slightest in ordinary green-sand moulds. The castings made were large, but extremely light, having very thin walls.

Commenting on the remarks made concerning wall thicknesses, he said it would almost appear that foundries had no inspection departments; and, indeed, he was afraid that many of them had not. Until about 18 months ago his firm had used comparatively few castings; but they had since come to use a very large number, and had to send quite a lot back to the suppliers because of dimensional inaccuracies. The suppliers were most surprised. He could not think of any casting which it would not be possible to inspect. For instance, a cylinder casting with water-cooled fins or jackets could be inspected in order to ensure correct wall thicknesses, without much trouble. He suggested, therefore, that all foundries should instal inspection departments whilst they were still making some profits, for, if they had not inspection departments after the war, they would not exist very long.

Hot Blast Cupolas

DR. A. B. EVEREST (Past-Branch-President), after complimenting Mr. Faulkner on his address, said he was interested to hear that the hot-blast cupola was being revived. It had attracted a good deal of interest some time ago, but so far as he was aware, although there were one or two more or less experimental installations, it had never really taken on; he asked whether it was being developed nowadays on a commercial scale. In asking also for some information as to the quality of its product, he said foundrymen had complained in the past that the quality of pig-iron had deteriorated since hot blast was applied to the blast furnace, and he suggested that it was likely that the hot-blast cupola would yield a product totally different from that of the ordinary cupola. The hot-blast cupola might be of interest economically, of course. Our present conception of what happened in a cupola was dependent on a certain speed of melting and depth of melting zone; all that would have to go by the board if hot blast were used.

Recalling that when he had visited the United States four years ago the Ford Company had been experimenting with an oil-fired cupola, he said that system was of no interest in this country at the moment, but he asked whether Mr. Faulkner had seen any references to any American developments of it. The Ford Company had used simply a cupola in which there was a heavy retractory cone in the base and an annular space no more than 2 in. wide. The pig was fed at the top, it rested in the annular space, and beneath that there were oil burners.

Reclamation of Swarf

Referring to the reclamation of swarf and scrap, and the process evolved by Buchanan whereby molten iron and swarf were mixed in a sort of "concrete mixer," he asked whether there was evidence that it was working yet, because the process seemed to hold immense possibilities. It might be of great interest, for instance, if one could make mechanically a pig or a lump of material in which iron was mixed with alloy or other additions, the final form of the mass being suitable for cupola melting.

As to the reclamation of scrap generally, he said that some foundrymen melted their own swarf at the end of the day's run, but others who had tried it since the war began had experienced difficulty and had abandoned it. But there were other uses for swarf and scrap, and any foundrymen who wished to use it would find that the rotary furnace and the electric furnaces could cope with it. A few foundrymen were briquetting it, although it might be considered expensive to do so.

Eaton Erb Process

The Eaton Erb process of permanent mould casting was another which had immense possibilities. The process did not seem to have developed in this country, largely, he presumed, because the cost of installing, running and maintaining the plant was high, and a tremendous output was necessary in order to justify it. Of course, in the Detroit area of the U.S.A., there was a market for large output in motor vehicle details, domestic castings, and so on.

With regard to the hydro-blast method of cleaning, and the fact that the water was allowed to run to waste and was not re-used, he said he had seen two hydro-blast plants, and the operators would not use the water again because it was mixed with sand and was therefore severe on the pumps, pipes and other equipment. He asked if Mr. Faulkner would confirm that water and sand were sprayed on the castings, for the usual process was to use very high powered jets of water only; for fettling castings up to 50 tons the operators directed the jets from outside the cabinets on to the castings, which latter were on a turntable inside. It was new to him that water and sand were sprayed on to the castings. In the ordinary hydro-blast equipment an enormous quantity of sand was reclaimed; the water was taken to settling tanks, the sand was collected and the water ran to waste.

Silicon Bronze

MR. A. J. MURPHY, after complimenting Mr. Faulkner on his excellent "hors-d'œuvre," said he had gathered that it was hoped that the magnesium founders would be able to use natural sands instead of the synthetic sands which they had used hitherto. The main reason for the use of synthetic sands for magnesium castings was that the synthetic sands possessed a permeability which, so far as he was aware, was not yet achieved in the natural sands.

The silicon bronzes had not yet made the inroads into the markets of the tin bronzes that Mr. Faulkner's remarks appeared to suggest. The silicon bronzes first attracted interest when tin was expensive and difficult to obtain. When the price of tin had fallen to a more normal level, the technical advantages claimed for the silicon bronzes had not enabled them to hold the market. In his view, the claims made for the silicon bronzes had been very much overstated. Wide experience showed that the tin bronzes were far better than the silicon bronzes in respect of bearing properties. Secondly, the silicon bronzes were more troublesome in the foundry than were the tin bronzes, by reason of high shrinkage, and any non-ferrous foundryman who had had experience of both would always prefer the normal tin bronzes. Further, silicon bronze was troublesome if it got out of place in the foundry; there were very few other copper alloys which were not seriously damaged by even slight contamination with silicon bronze, or with silicon in any form.

AUTHOR'S REPLY

MR. FAULKNER replied to the discussion. Commenting on Mr. Curry's reference to the use of borings for melting, the borings being filled into sardine tins, he said he believed the ideal method of filling the canisters was by the use of jar ramming machines, rather than to fill the canisters manually.

The adverse criticism which Mr. Curry had directed to new methods of control was not really justified, and he felt sure that Mr. Curry, as a modern foundryman, would agree that it was best, wherever possible, to transfer control from the skilled man in the foundry to the office. It was too much to expect to have 100 per cent. confidence in any skilled man getting all his thicknesses exactly right. The office had most of the responsibility nowadays, and should take as much as possible of the remainder.

The Old Brinell Theory

Commenting on Mr. Kayser's remarks, he said they had led him to try to reconstruct the Brinell theory. Speaking from memory, he said Brinell had put forward the idea that the manganese content plus 5.2 times the silicon content, plus 90 times the aluminium content, equalled a constant—though he could not remember the constant. However, below it blowholes occurred, and above it piping developed. The theory was most interesting and helpful, in the then existing state of knowledge, and it had worked practically. He sometimes wondered whether it would be possible for a Brinell of the future to work out a theory of similar interest and utility as applied to other alloys.

Following the jocular remark that Dr. Everest's information about the hydro-blast system of cleaning was quite out of date, and should be ignored, he said that quite definitely certain quantities of sand were added to the water throughout the whole time of blasting, and that was the whole difference between that later system and the ordinary hydro-blast system as used in the Lanz foundry at Mannheim, and which was never a success. The idea of water blast was first originated by the late Mr. Charles Markham, of Chesterfield. At the time he had introduced it, oil-sand cores had come into production, and he had not proceeded with his experiments, but he should be credited with the idea.

Enlarging upon Dr. Everest's references to the Eaton Erb process of permanent mould castings, he said various people in this country had turned it down; he did not think that the cost of the licence or the cost of the machine was the deciding factor, but rather the consideration that this country was not large enough and did not provide a sufficient volume of orders to warrant the installation of such a machine.

The Hot Blast System

In order to clarify one's thoughts concerning the application of hot blast it was helpful to think of the conditions in, say, the Siemens furnace, with its big blocks of regenerators. If such a plant were working for only a short time, it would obviously be inefficient. In a cupola plant which melted really large quantities, in 24-hr. and even longer runs, real advantage could be derived from it. The new system

(*Continued on page* 320.)

STANTON-DALE

Refined

PIG IRON

IS CHARACTERISED by closeness of grain structure, uniformity of composition and fine graphitic carbon evenly distributed.

IS PRODUCED to guaranteed analysis in seven standard grades.

CAN BE MADE to customers' individual requirements with total carbon from 2·6 per cent. upwards.

SHOULD BE USED to tone up high phosphorus irons and scrap, to replace Hematite, and to produce castings for all high duty purposes.

Users are invited to avail themselves of the Stanton Technical Service which offers free expert advice on special mixtures and other Foundry problems.

THE STANTON IRONWORKS COMPANY LIMITED, NEAR NOTTINGHAM

Modern Trends in Foundry Practice

(*Concluded from page* 318.)

which had been developed by a very prominent member of the Institute in Lancashire had a recuperative rather than a regenerative system; and that was the major difference. In many recuperative systems there was not such a mass of refractory to heat up, and it would not be surprising if this system became a success. Something on the same lines was just coming over from Italy before the war broke out. The quality of the iron would necessarily have to be adjusted to the new conditions, but the experience of the Griffin Wheel Company had shown this to be easily possible.

As to the use of naturally bonded sands for making magnesium castings, he said that work on the subject had proceeded sufficiently far to enable the simplest castings to be made successfully by using those sands, and it was hoped to go further. Evidently the difficulty with regard to permeability had been overcome.

Silicon Bronzes

In regard to the silicon bronzes, he said he had not confined his attention to developments in this country, but had taken as broad a view as possible, and perhaps he had been thinking as much about American practice as of British. He confirmed that in the past the silicon bronzes had failed to hold the market against the tin bronzes when tin was at a reasonable price. At the same time, the technique of the silicon bronzes was always improving. Whilst it was claimed that the bearing qualities of the silicon bronzes were equal to those of the tin bronzes, he said the better bearing metal was still gunmetal and, as Mr. Murphy had suggested, that claim for the silicon bronzes needed substantiating. However, the silicon bronzes were helpful whilst tin was so expensive.

Vote of Thanks

MR. HAROLD WILSON proposed a hearty vote of thanks to Mr. Faulkner for having given so admirable an address on modern trends, not only as affecting Britain, but the world at large. It was of great advantage to have so broad an outline of progress throughout the world.

MR. E. H. BROWN, seconding, said there was a great field for discussion in the future on the merits or de-merits of the policy of bringing the foundry into line with the mechanical side of the engineering industry by introducing in the foundry its own inspection system, particularly having regard to post-war competition. He believed there would be a big demand for die cast products, but that sand castings might compete quite easily if they could be produced with the same degree of accuracy.

The vote of thanks was carried with acclamation.

MR. FAULKNER, in a brief response, assured the members that he was always glad to do anything he could for the Institute. He hoped his address would be accepted as an effort to keep the members together, pending better times in the future.

Entropies of Inorganic Substances

Bulletin 434 of the U.S. Bureau of Mines is the ninth section of the series "Contributions to the Data of Theoretical Metallurgy," by K. K. Kelley, and deals with the entropies of inorganic substances, giving a revision (1940) of data and methods of calculation. This booklet of 115 pages (price 15 cents) is an outstanding contribution to an important branch of the thermodynamics of the elements and inorganic substances, of which some 150 are listed. A short section of current methods of calculating entropies from low-temperature heat-capacity data, spectroscopic data, molecular-constant data, reaction entropies and residual-ray data, is followed by a concise summary of values based on the most up-to-date research results. The survey is fully documented with 419 references to the recent literature.

Salvaging Alloy Steel

Recently the Iron and Steel Branch of the O.P.M. in the United States sent out *questionnaires* to fabricators and manufacturers estimated to be using approximately 96 per cent. of the current production of alloy steels, including the stainless steels, requesting information on the extent to which alloy steel scrap, including stainless steel scrap, is segregated, by types and grades, from simple carbon steel scrap; the tonnage of each type of scrap produced during August, 1941; the facilities available for shearing, crushing, baling, washing, briquetting or otherwise preparing the scrap; and the names of the steel producers or scrap dealers to whom the scrap is disposed.

A letter accompanying the *questionnaire* points out that the indicated demand for such alloying elements as nickel, chromium, molybdenum, etc., exceeds the current supply and that, while facilities for the production of these alloying elements are being expanded, all possible sources of supply must be explored and developed. In many manufacturing plants from 20 to 40 per cent. of the alloy steel or alloy iron delivered by the producer or vendor is lost as scrap during conversion, and in the production of some products the amount of scrap may run to between 70 and 80 per cent.

The alloy content of such scrap is to a large extent reclaimable, but at the present time a large part of this alloy content is being permanently lost because it is mixed with other steel or metal scrap. This is particularly true in the case of machine turnings or chips, flashings or chips, flashing from forgings, etc. Alloy losses in the case of bar ends, punchings, rejects and similar heavy melting scrap, while smaller, are still relatively high.

The vast amount of alloy scrap produced daily by the industrial plants should, if properly segregated and identified, and returned in usable form, free from contamination, to the alloy steel producers, yield a large tonnage of these vital alloying elements. In addition to making a valuable contribution to the defence programme, most plants, the letter states, will find that the premium price obtainable for alloy content will result in definite operating economies.

Midland Coke Research Committee

The Midland Coke Research Committee, which was formed in 1926, is financed by grants from the producers and users of oven coke made in the Midland area, supplemented by a grant, from the Department of Scientific and Industrial Research, which is administered by the Industrial Research Council of the British Iron and Steel Federation. The objects of the Committee are to study and evaluate the properties and qualities of coke, to standardise methods of assessing its properties, and to determine means of improving its qualities. The properties of coke with respect to its use in blast furnaces and for other metallurgical purposes have been the main concern, but the use of coke for domestic purposes and for other special purposes is also receiving attention. The experimental work of the Committee is carried out in the Department of Fuel Technology of Sheffield University and at neighbouring coke-oven and blast-furnace plants.

During 1940 the Committee became a financially independent organisation though continuing, as in the past, to be provided by the University with free accommodation, heating, lighting and other services. Dr. R. A. Mott was appointed by the Committee to be its Director of Research and, by the University, to be Lecturer in Coking Processes in the Department of Fuel Technology. In its annual report a summary of the work of the Committeee is set out under the headings: Blast-furnace records; coke-oven trials; experimental oven tests; the classification of coal for coke making; the testing of coal and coke; and the combustion of coke.

The British Cast Iron Research Association

(*Concluded from page* 316.)

used and recommended in them, and this has been of advantage to the industry. The training of laboratory apprentices has been extended by providing some of them with a period of practical training, and the Council is greatly indebted to the Midland Electric Manufacturing Company, Limited, Revo Foundry Company, Simplex Electric Company, Limited, and Walsall Conduits, Limited, for valuable assistance in this matter.

In an industry which was gravely handicapped during the last war by a shortage of technically-trained men of good calibre, it is of interest to note that through the British Foundry School (which has been suspended for the duration of the war) and through transfers to the industry of members of the B.C.I.R.A. staff, something like sixty men now occupy responsible positions in connection with the industry. If members interested in obtaining the services of such men could indicate their requirements, the number in training could be accordingly increased, or alternatively, the scheme could be applied to men nominated by members.

Reports and Publications

The "Bulletin and Enamelling Abstracts" have appeared regularly at quarterly intervals. They have listed fifteen External Reports prepared and presented by the staff to scientific bodies, together with translations of foreign Papers. Of the Research Reports circulated confidentially to members, two printed reports have been issued and fourteen in typescript for circulation on request. One important report has been made available to the industry as Special Publication No. 7, "The Sampling and Analysis of Cast Ferrous Metals."

Finance and Membership

Finance.—The subscription income for the year shows a slight decline compared with the previous year due, in part, to difficulties in sending currency from Australia. The total income shows an increase of £170 over the previous year. Running expenditure is reduced and less expenditure has been incurred on plant and equipment. A credit balance remains on the year's working, and it has been found possible to add to the Building Fund, which now stands at £7,500.

Membership.—At the close of the year the number of ordinary and trade members was 368 and of Associate members 46, a net increase of four over the previous year.

Relations with Other Bodies.—These continue normal and the representatives of the Association on other bodies are substantially unchanged.

New Premises

Members are aware that for several years the Council has had under consideration the question of finding for the Association a suitable permanent home. Since the outbreak of war this has assumed greater urgency. The Executive Committee, therefore, with the approval of the Council, have endeavoured to find premises suitably accessible to the city. Negotiations have been in progress for some time and a full statement will be made to members at the annual meeting.

The change has the cordial support of the Department of Scientific and Industrial Research, representatives of which—Mr. A. L. Hetherington, C.B.E., assistant secretary to the Department, and Mr. C. A. Spencer—recently saw the premises during an official visit to examine the work of the Association as a whole.

The report is signed by Sir H. Hartley as chairman of Council, and Mr. J. G. Pearce, the director and secretary.

BENTONITE SUBSTITUTE

ANNOUNCEMENT

Since the introduction into Gt. Britain of Genuine Wyoming Bentonite it has been our pleasure and interest to distribute the largest bulk of this material—acknowledged to be the finest clay for foundry purposes extant.

Whilst regretting that in the National Emergency we are temporarily unable to supply Genuine Wyoming Bentonite in normal quantities, we have now established and will shortly be able to supply regularly an English produced substitute known as DISTRIBOND.

Where DISTRIBOND has been tested under foundry conditions it has shown satisfactory results, consequently we are anticipating large demands for this new material.

Although our production at this stage is of modest proportions it is our intention to increase this in accordance with the trades requirements.

Meanwhile we are able to deliver trial quantities of a few tons each and will maintain our full demonstration service and assistance as has been the case with Bentonite.

In view of our old association with the Foundries and our services towards establishing Bentonite we feel we merit the continued support of all our old friends during this period of transition and will welcome enquiries for this new all British Bentonite Substitute.

The District Chemical Co. Ltd.

COMMONWEALTH HOUSE, 1-19 NEW OXFORD STREET, LONDON, W.C.1

Telephone: CHAncery 6041. Telegrams: "Natron, Telex, Lo'ndon."

Modified Iron and Steel Distribution Scheme

BULK AUTHORISATION FOR SMALL ORDERS

The Ministry of Supply, Iron and Steel Control, announce that now that the principles of the Iron and Steel Distribution Scheme are well understood, it is felt possible to reduce the clerical work involved by making it unnecessary for authorisations for iron and steel to be issued when placing orders for manufactured articles where the manufacturer would require 1 cwt. or less of iron and steel to execute each order. Manufacturers supplying such orders are instead invited to apply to the Board of Trade or the Ministry of Works and Buildings for a bulk authorisation covering the iron and steel needed to execute such small orders.

When a bulk authorisation on Form M covering these small quantities has been obtained, authorisations for 1 cwt. or less of iron and steel must not be asked for, or if received from any customer, must not be treated as valid and used to acquire iron and steel in addition to that covered by the bulk authorisation. Thus, the bulk authorisation must be used to meet small orders irrespective of the Government Department or purpose for which the articles supplied are to be used.

Where wholesalers or retailers fulfil small orders within the limit referred to they should not ask their customers for authorisations, but when ordering from their suppliers should certify the total quantity supplied under the small quantities limit.

As the quantity of iron and steel available for bulk authorisations will be limited, a responsibility will rest on retailers, wholesalers and manufacturers to see that small orders for articles containing iron and steel are only accepted for purposes which are essential and that the articles they supply are fairly distributed.

The Ministry of Works and Buildings will issue the bulk authorisations in the case of articles required primarily for the building trade (see the appended schedule), and the Board of Trade for other articles. Firms wishing to take advantage of these arrangements should apply to the appropriate Department for the form on which to enter the necessary particulars. In cases where manufacturers already receive bulk authorisations from these or other Government Departments covering all or part of their orders, they should not, of course, apply for any further authorisation in respect of small orders already covered.

These arrangements will come into operation as soon as the applications are received and the bulk authorisations are issued by the Departments concerned. In any case, it is envisaged that by January 1, 1942, the arrangements will be in general operation and it will not be necessary for Form M to be used in the case of small orders for manufactured articles.

It will be appreciated that the foregoing arrangements in no way relax the need for a person acquiring iron and steel (in the forms listed in the First Schedule to the Control of Iron and Steel (No. 15) Order) to obtain an authorisation. They do, however, provide for a bulk authorisation for iron and steel to be given to manufacturers in the cases referred to, instead of the manufacturer having to collect a large number of separate small authorisations from each of his customers.

Schedule: Form M (Bulk Authorisations)

Partial list of goods for which the Ministry of Works and Buildings issue bulk authorisations. Applications should be addressed to the Secretary, Ministry of Works and Buildings (A.S.69), Lambeth Bridge House, Albert Embankment, London, S.E.1.

Stoves, grates, ranges and cooking apparatus (solid fuel); oil heaters and cookers.

Cast-iron hot-water boilers (including gas-fired boilers used for central heating), radiators and radiator fittings.

Cast-iron baths, sanitary cisterns and other sanitary cast-iron and steel goods.

Pumps for domestic and agricultural water supplies.

Builders' ironmongery of cast iron, not elsewhere specified: Gate fittings; door springs and checks; door bolts (wrought iron); door plates; door letter-boxes; handles and knockers; locks and hinges (except furniture locks and hinges and locks for cases); latches; hasps and staples; shelf brackets; and other items of builders' ironmongery.

Steel flush pipes.

Expanded metal for goods for all purposes not covered by the Ministry of Home Security and not being machine-guards.

Metal windows and window fittings, skylights, roof lights, ventilators and ventilator frames.

Exterior fencing.

Sanitary fittings; cutter fittings; sliding door fitments; and conduit fittings.

Packers and other users of containers or articles made from tinplate, terneplate or black-plate should not apply for a small quantities bulk authorisation themselves, but should certify on their order to the makers of the containers, etc., the total quantity supplied under the small quantities limit. The bulk authorisation will be arranged with the maker of the containers by the Administrator of Tinplate Distribution on behalf of the Board of Trade.

New Estimates of U.S. Steel Requirements

Following the reports of Mr. Gano Dunn, the former consultant to the O.P.M., on the expansion in U.S. steel capacity required to meet defence needs, and which were published in March and May last, Mr. W. A. Hauck, the new consultant, has prepared a further estimate, which was released early last month. The report was prepared to meet the request of the President to investigate the possibilities of increasing steel ingot capacity by 10,000,000 tons per year, and also to determine what would be involved in a further increase of 5,000,000 tons a year.

Mr. Hauck considers it possible to increase the present steel-making capacity of the United States by 10,000,000 tons. Projects already approved and under construction amount to almost 3,000,000 tons, and about 5,500,000 additional tons are now specifically needed for certain shortages, such as alloy steels for aircraft, tanks and tools; ordinary steel plate for ships, freight cars and boilers; armour plate for tanks, ships, gun mounts, helmets, and planes; Bessemer steel principally to cover scrap shortage; and steel expansion on the West Coast along many lines to make this district largely self-supporting. This leaves only about 1,500,000 of the 10,000,000 unapplied.

Further needs are in sight, and the allocation of this 1,500,000 tons can be made to good advantage to take care of several programmes that have been submitted. It is accordingly recommended that immediate action be taken to provide the 10,000,000 tons of additional capacity, including all the necessary integrated facilities together with extra pig-iron capacity needed to offset the shortage of scrap.

Some of the 10,000,000 tons increased capacity can be completed within nine months, and substantially all of it within two years. It will cost up to $1,250 million to provide the additional 10,000,000 tons capacity, practically all of which must be Government financed. This cost can be reduced and earlier production assured by expanding facilities in existing plants wherever feasible. A flexible plan must be promptly found for financing increases in capacity under this method which should recognise: (*a*) The expansion facilities are installed only because of the emergency; (*b*) their cost will be in excess of normal cost, and (*c*) they will not be self-liquidating, and their normal depreciated value will be in excess of their subsequent useful value, unless the emergency is of long duration.

Approximately 75,000 men will be employed in the operation of the 10,000,000 tons additional capacity.

A further increase in ingot capacity of 5,000,000 tons in addition to the 10,000,000 tons, will be very difficult to obtain, and may take up to three years to complete. The extra demands on the suppliers of steel plant equipment would necessitate expansion of their plants with consequent delays in deliveries. This additional 5,000,000 tons expansion would cost at least $750 million, and would require 1,500,000 tons of steel during the three-year construction period or at the rate of 500,000 tons per year. Operation of the new facilities included in the 5,000,000-ton expansion would require a minimum additional 25,000 men.

Overseas Notes

International Nickel Developments

The report of the International Nickel Company of Canada, Limited, and subsidiaries for the six months ended June 30, 1941, shows a net profit of $17,315,607 after all charges and taxes, etc., equivalent, after preferred dividend requirements, to $1.12 per common share. This compares with a net profit of $18,060,293, or $1.17 a common share, in the corresponding period a year ago, and $17,773,438, or $1.15 a share, for the first six months in 1939. To meet the greatly augmented nickel requirements of the metal consuming industries and expanding needs of the Armed Forces of Canada, Great Britain and the United States, substantially increased amounts of nickel have been made available. All production facilities of the company are operating at full capacity. Since the outbreak of the war, the allocation of nickel in Canada and the United Kingdom has been handled in accordance with the wishes of the Canadian and British authorities. Last March, all nickel imported to or produced in the United States was placed on a priority basis.

U.S. Steel Corporation's 1941 Output

The combined iron-ore production by all United States Steel Corporation subsidiaries this year will be about 40,800,000 net tons, according to the "U.S. Steel News." The Oliver Iron Mining Company, operating on the Lake Superior ranges, expects to ship a record total of 35,800,000 net tons. Its prior record of 34,803,210 net tons was established in 1916. Coal production by U.S. Steel subsidiaries this year is estimated at 30,000,000 net tons. Limestone and dolomite output will approximate 16,800,000 net tons. Four thousand beehive coke ovens have been put back into service to meet demand for blast-furnace fuel, which exceeds the capacity of available by-product coke ovens. Besides the production of these beehive ovens U.S. Steel furnaces are consuming the coke output of 4,500 additional beehive ovens not operated by its coal subsidiaries. Of this year's production of iron ore, coal and limestone, the northern subsidiaries alone will require approximately 79,000,000 net tons at their present rate of steel production.

Soviet Aluminium Position

Soviet production of aluminium is of comparatively recent origin, but the industry has expanded so rapidly that in 1936 the U.S.S.R. had the third largest metal output in the world. The following year this was increased to 250,000 metric tons, equivalent to no less than 45 per cent. of the world's total. In 1937 there were four aluminium plants supplying their product to three reduction plants, and further expansion of the industry was planned. The estimated output for the following year was 43,800 metric tons, and in 1939 this figure is believed to have increased by 14 per cent. to 50,000 metric tons. The apparently disappointing progress of the Russian aluminium industry in recent years is attributable to shortage of electric power, obsolete equipment, high sulphur content in the alumina produced in blast-furnace slag, and other difficulties. The bulk of the Soviet bauxite reserves, now estimated at 53 million tons, consists of essentially low-grade ore.

THE SOUTH AFRICAN GOVERNMENT has prohibited the use of aluminium in the manufacture of any article without permission of the Minister of Commerce and Industries.

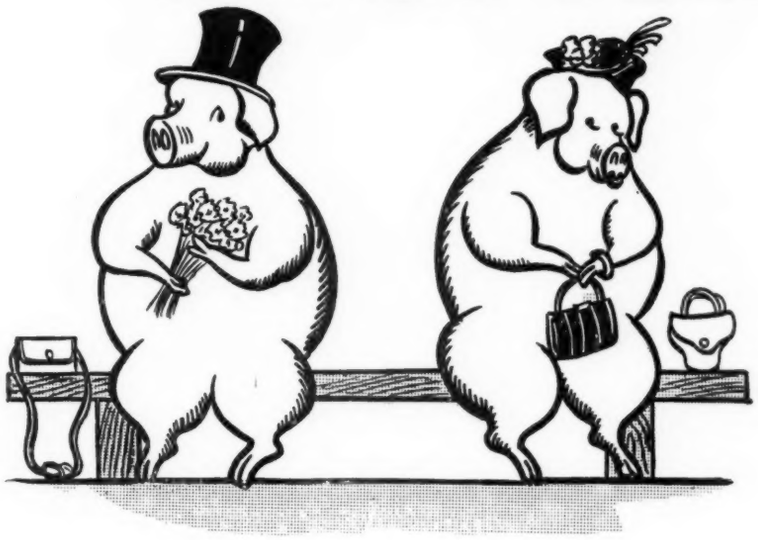
AFTER MONTHS OF EFFORT by United States Government defence officials to get industry to turn to plastics as a substitute for metals, a shortage of plastics, synthetic resins, and their components has developed, and their use is now being officially restricted.

ACCORDING TO A VICHY announcement, supplies of coal, iron and steel to French industry have been cut drastically, the cuts coming into effect immediately. It is stated that the cuts are due to "the inability of Germany and Belgium to continue deliveries of raw materials and to increasing transport difficulties."

MEXICO WILL export to the United States for the next 18 months all surplus strategic and critical materials under an agreement with Metals Reserve Company and Defence Supplies Corporation. Antimony, copper, graphite, lead, mercury, tungsten, tin, zinc and henequen are covered by the pact. The Mexican Government has ruled that exports of these commodities may be made only to points within the hemisphere.

W

Delayed ... ...Action



We are not naturally shy of proposals to use "Warner" Pig Iron, but in the present circumstances, when we cannot always maintain our reputation for prompt despatch, we ask for notice of your intentions as early as possible.

Procrastination is almost as dangerous in individuals as in bombs, so far as war-time production is concerned. Anticipation of your requirements will help us to fulfil them to our mutual satisfaction.

Warner's

Special Pig Irons

WARNER AND CO. LTD., CARGO FLEET, MIDDLESBROUGH

W

The Week's News in Brief

Trade Talk

CARRON IRONWORKS, of Falkirk, have subscribed a total of £833 during the last quarter to charitable institutions.

MR. ALFRED EDWARDS, M.P., speaking at Blaydon (Durham) recently, expressed the view that limitation of profit to employers and men was holding up production. We should reconstruct our present system of production, he declared, before it was too late.

MR. ERNEST BEVIN, Minister of Labour, received a deputation at Swansea recently to discuss the problem of idle steel and tinplate works in West Wales. It was urged on Mr. Bevin that every possible effort should be made to make use of existing works and to reclaim local industries.

A STEP TOWARDS removing "bottle-necks" and other delays in Scottish industrial production has been taken by the establishment in Glasgow of a capacity clearing centre. Created on similar lines to organisations already existing in England, the centre has for its object the fuller use of engineering capacity.

SHOP STEWARDS AND TRADE UNION MEMBERS associated with the engineering, shipbuilding and iron and steel industries attended a conference in Glasgow last week to discuss suggestions "for the removal of obstacles to increased production." The conference had been arranged at the instigation of shop stewards' committees.

THE CLAIMS FOR AN INCREASE in engineering and shipbuilding workers' wages—refused by the employers—are to be referred to the National Arbitration Tribunal by the Confederation of Engineering and Shipbuilding Unions. It is probable also that the Amalgamated Engineering Union and the Foundry Workers' Union will take to arbitration their claim for an increase of 4d. an hour.

NORTHUMBERLAND COUNTY COUNCIL had before them last Thursday a report containing details of the proposals for a new bridge over the Tyne at Scotswood after the war. The consulting engineers suggest that three types of bridge could be built—a high level fixed bridge costing £1,097,000, a low level road bridge with opening span estimated to cost £932,000, and a low level combined road and rail bridge costing £1,289,000.

THE CLYDE shipbuilding and engineering unions and the shipyard employers have agreed to continue a 47-hr. working week during the winter. There will be no systematic or general overtime from Monday to Friday, because of the black-out, but all firms are recommended to maintain 23 hours' overtime in each four weeks, making an average of 52¼ working hours a week. The overtime is to be worked on one Saturday and three Sundays in each of the four weeks. Firms are asked to arrange for one entire week-end free from overtime in each of the four-week periods. The unions are recommending their members to adopt the scheme, and also propose that the free week-ends should be staggered between neighbouring firms.

EXPORT OF GOODS (CONTROL) ORDER, NO. 38.—Under a Board of Trade Order of November 4, 1941, export control is extended to cover a wide range of metal manufactures, including steel shot, grit and sand (chilled-iron shot), and welding electrodes. The control relating to certain specified parts (engines and chassis, etc.) of mechanically-propelled road vehicles has been extended to cover all parts and accessories, wholly or mainly of metal, of such vehicles. Certain specified items (buffers, springs, wheels, etc.) of rolling stock, previously included as railway and tramway material, will now be covered by the comprehensive prohibition in respect of parts and accessories, wholly or mainly of metal, of rail locomotives and rail vehicles. This Order (S.R. & O., 1941, No. 1713) is issued by the Stationery Office (price 1d.).

THAT THE TROUBLE FACING the British shipbuilding industry in the 1919 to 1939 period was partly due to the failure of the industry to adapt itself to the changed outlook of the world, was the view expressed by Sir Westcott Abell when he delivered the Andrew Laing lecture before the North-East Coast Institution of Engineers and Shipbuilders at Newcastle-upon-Tyne on October 31. Sir Westcott said that 1914-18 had shown that in a world war it was necessary to be prepared to lose 1,000 ships of 5,000,000 gross tons per annum. For this a reserve of vessels was needed. From 1919 only 2,483 ships had been built in the world, outside Germany. Referring to the shipbuilding decline after 1919, Sir Westcott said that the trouble to British shipbuilders was that orders for foreign ships practically ceased except for special types. The failure seemed to have been due to the lack of vision in the country of the need to adapt the industry to the changed conditions in the world. In 1929, when British shipbuilding was coming into its own, Sunderland yards built 53 ships of an average tonnage of 4,200. In the five years from 1931-35 the yards built only 28 ships of 74,000 tons—only three months' work in a good year. Sir Westcott said that the worst effects of the shipbuilding decline were that skilled workers left the industry to join other trades.

Obituary

MR. E. A. FLATTERS, for many years a departmental manager for Hadfields, Limited, Sheffield, has died in his 79th year.

MR. SIMON GUGGENHEIM, president of the American Smelting & Refining Company, has died in New York at the age of 74.

MR. J. A. HARPER, who was well known in the foundry industry in the Midlands, has died at the age of 77 years. He was managing director of William Harper, Sons & Company, Limited, Star Foundry, Willenhall, founded by his father.

MR. JOHN S. MILLER, who was an assistant secretary of Stewarts and Lloyds, Limited, iron and steel manufacturers, Glasgow, with whom he had served for 38 years, has died. He was formerly office manager of the Clydesdale Iron and Steel Works.

MR. W. W. MARRINER, who had been associated with Yarrow & Company, Limited, for over 50 years and had been a director for several years, died at Halifax, N.S. Mr. Marriner travelled extensively for the firm in many parts of the world.

MR. W. N. WESTON, M.I.Mech.E., died at his home in Loughborough on November 1. He was closely associated with Herbert Morris, Limited, Loughborough, for over thirty years, and for the last quarter of a century had been a director of the company.

SIR WILLIAM H. DIAMOND died at Cardiff on Monday at the age of 76. Sir William, a former president of the Shipbuilding Employers' Federation, was a partner in the firm of Thomas Diamond & Company, Limited, ship repairers, engineers and boilermakers, of Cardiff.

MR. J. S. GUILD, well known in Tyneside engineering circles, has died at the age of 74. For 24 years he had been manager with Emerson Walker, Limited, Dunston-on-Tyne, and afterwards with Douglass Bros., Limited, Globe Ironworks, Blaydon. Mr. Guild retired recently.

MR. WALTER DEAKIN, a pioneer of the machine-tool industry in Birmingham, died on October 24, in his 83rd year. He retired in 1929. He was one of the founders and at one time managing director of H. W. Ward & Company, Limited, Selly Oak. He was also a director of Rudge Littley, Limited, ironfounders, West Bromwich.

MR. COLIN LIVINGSTON, a former blast-furnace manager of the Stafford Coal & Iron Company, Limited, has died at the age of 68. A member of a Coatbridge family, Mr. Livingston received his early training with the Coltness Iron Company, Limited, and subsequently spent several years in South Africa. He was for many years a prominent member of the West of Scotland Iron and Steel Institute and had held office of vice-president. Mr. Livingston went to North Staffordshire in 1919, when he was appointed blast-furnace manager of the Stafford Coal & Iron Company, Limited. He remained in this position for about ten years, when he retired owing to ill-health. Three years ago he became consultant to the Renishaw Iron Company, Limited, Sheffield, in which district he had been residing.

Contract Open

Repton, November 24—Construction of a pumping station and provision and laying of 4-in. cast-iron rising main, etc., for the Rural District Council. The Engineer, The Poplars, Rolleston Road, Burton-on-Trent. (Fee £2 2s., returnable.)

Personal

MR. G. R. WOODWARD, A.L.A., of the B.C.I.R.A. information staff, has joined the Royal Navy.

WE LEARN from an authoritative American source that Prof. Albert M. Portevin is now located at Ugine, Savoie, in "Vichy" France.

MR. E. MORGAN, M.Sc., of the B.C.I.R.A., has been appointed to succeed the late Mr. S. E. Dawson as chief metallurgist to the Stanton Ironworks Company, Limited, and thus brings to an end a long period of service with the Association.

MR. E. TAYLOR-AUSTIN, F.I.C., chief chemist to the British Cast Iron Research Association, has been appointed assistant blast-furnace manager to the Darwen & Mostyn Iron Company, Limited, and is succeeded by Mr. W. Westwood, B.Sc., who has been chief assistant in the B.C.I.R.A. laboratory for the past three years.

MR. H. J. BAYLEY has resigned from the post of Midland technical representative for Hepworth & Grandage, Limited, Bradford, due to health reasons, and, pending the appointment of a new representative, Mr. W. A. Wilson, technical research engineer to the company, will be taking charge.

MR. F. SCOPES, Director of Home Ores since the formation of the Iron and Steel Control, has resigned his position on his appointment as assistant managing director of Stanton Ironworks Company, Limited. Mr. Scopes has done most valuable work in organising the supply of home ore, and has been succeeded by Mr. James Whitehouse.

MR. BERNARD THOMAS has been appointed managing director of Midland Heat Treatments, Limited. This new company has been formed to take over the external heat-treatment activities hitherto carried on by the Chillington Tool Company, Limited, Wolverhampton, of which Mr. Thomas is technical manager, a position he retains in addition to his new appointment.

MR. GEORGE WOOD has been released from the Directorate of Scrap, Iron and Steel Control, at the urgent request of Thomas W. Ward, Limited, to enable him to return to his firm in order to take up the position of joint managing director. This has been necessitated by the death of the late chairman, Dr. Joseph Ward. Mr. George Wood has been associated with the Control since its formation, first as Deputy Director of Scrap, and then from November, 1939, as Director of Scrap. At the request of the Controller, Mr. Wood has agreed to remain available for consultation. He has been succeeded by Mr. F. S. Towle.

Wills

SMALLWOOD, P. W., partner in Pritt & Company, iron, steel and tinplate merchants, London...	£14,447
SANDBERG, C. P., of Edenbridge, Kent, and of Messrs. Sandberg, consulting and inspecting engineers, London, S.W.1	£43,678
WILSON, W. H., managing director of Barber, Wilsons & Company, Limited, brassfounders and valve manufacturers, of Wood Green, London, N.22	£8,739
CALLENDER, T. O., a director of Callender's Cable & Construction Company, Limited, the Anchor Cable Company, Limited, St. Helens Cable & Rubber Company, Limited, and Thomas Bolton & Sons, Limited, copper smelters, of Liverpool	£163,297

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

Heller & Sons (Engineers), 63L, Turnpike Lane, Hornsey, London, N.8—£3,000. M. N., S., and L. Heller.

R. C. Harrison & Sons (Brassfounders), Gough Road, Leicester—£5,000. R. C., J. C. R., and E. R. Harrison.

Fenton Jig, Tool & Gauge Company—£3,500. F. B. Frost and C. G. King, 92, Belmont Rise, Belmont, Surrey.

Blatter Engineering Company—£1,000. A. J. Luck and E. A. Blatter, 58, Park Drive, Winchmore Hill, London, N.21.

J. R. Parsons—Manufacturers of turned parts for engineers and others. £4,000. J. R. Parsons, 50, Central Avenue, Pinner, Middlesex.

Sarbatt Stone & Company, 184, New Kings Road, Fulham, London, S.W.6—Engineers, etc. £3,000. S. G. N. Stone and L. S. Smith.

W. A. Hunwicks & Company, Chapel Street, Halstead, Essex—Constructional and agricultural engineers. £1,000. W. A. and R. W. Hunwicks.

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INSULATION: *Amberlite* Bricks, Cement and Concrete.
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Raw Material Markets

It is the usual practice in normal times for iron consumers to accumulate supplies when transport is free from interruptions, but this year, owing to shortage of supplies of certain descriptions of material, little stocking has been carried out. Users of high-phosphorus iron have been permitted to take up additional supplies during the summer months, as this type of iron is comparatively plentiful, but in most other directions licences are granted only for current needs. On the whole, however, the outlook for the coming winter is not unsatisfactory, and there can be no doubt that essential consumers will continue to be provided with sufficient raw material to enable them to operate without interruption.

The announcement by the Iron and Steel Control that provisions for facilitating the purchase of small parcels of iron and steel are being extended to small orders for articles containing iron and steel will be welcomed by manufacturers and consumers alike. The concession applies only to a manufacturer who buys appreciable quantities of iron or steel in the aggregate, but who requires small amounts to fulfil individual orders.

Pig-Iron

MIDDLESBROUGH—Basic iron is being delivered by makers on the North-East Coast to the steelworks satisfactorily, as, also, is refined iron, which is required in substantial tonnages to counteract the shortage of hematite. So urgent is the call for steelmaking irons that ironworks have very little opportunity to attend to the needs of foundrymen; fortunately, the latter are able to get all they require from the Midlands, and rail deliveries from this area are regular and sufficient in volume to meet all demands. In fact, several users have been able to lay down stocks of high-phosphorus iron, the Control authorities having granted licences for this purpose.

The hematite position has certainly improved during the past month or so, and there are instances of manufacturers placing a portion of their output into reserve, owing to the fact that current licences have not absorbed full production. This is not an indication of any falling away in demand for hematite, but is due to the gratifying arrangements which many consumers have made to utilise other grades of iron as a substitute. There is no prospect of a really large accumulation of supplies being possible, but the Control are naturally desirous of safeguarding future needs as far as they are able.

LANCASHIRE—Machine-tool makers and heavy electrical engineers, together with other branches of the heavy engineering industry, are very busily engaged, and the demand for pig-iron from these concerns is, in the aggregate, appreciable, but does not make up for the quietness in other sections, such as the light-castings and jobbing foundries. Textile machinists, too, are no more than moderately employed. Iron from the Midlands is arriving here promptly, so that continuous operations are assured. Special refined iron is in increasing demand, and is being used to make good the shortage of hematite.

MIDLANDS—High-phosphorus and refined pig-irons are readily forthcoming to meet all demands, but the same cannot be said of low-phosphorus iron or hematite. Supplies of the latter are sent to consumers when the need is urgent, but every economy is encouraged, as production is far below normal consumption. Many hematite consumers have found that refined iron has met their purpose when hematite has been unprocurable, and this accounts for the considerable expansion in the demand for this type of material. The better qualities of iron are used largely by makers of heavy castings, who are committed fully over some months to come, with the prospect of replacement orders being plentiful. Conditions in the light-castings trade remain on the quiet side, and it is unlikely that there will be much change for a long time, as makers cannot contribute to any extent to the war effort, and normal outlets for their products have declined, both in number and volume.

SCOTLAND—There is plenty of war work for the heavy engineering industry, and very busy conditions prevail. The position of the light-castings section, however, is still just as difficult as ever, and short-time working is general, although a few concerns have been able to take on a certain amount of Government business. Supplies of foundry iron are satisfactory, but it is necessary to supplement home production by imports. Hematite remains available only to those works which are engaged on priority orders, and which cannot make do with other types of iron. The steel industry is, of course, normally a prolific user of hematite, but is now incorporating alternative grades when practicable.

Coke

Suppliers of foundry coke are favourably placed, and consumers are getting steady deliveries. Buyers generally have bought well ahead, on the condition that the price paid be that ruling at the time of delivery, and have accumulated handy reserves. Best Durham foundry coke is quoted on the basis of 46s. 9d. per ton, f.o.t. ovens, or 62s. 9d. delivered to Birmingham and Black Country stations.

Steel

Ever-increasing efforts are being made to enlarge still further the output of steel, and the steady flow of deliveries, in spite of the unprecedented pressure, is ample evidence of their success. The raw materials position is eminently more favourable than it was some months back, and producers are well supplied with iron ore, pig-iron and scrap. Plant extensions now being carried out are largely concerned with special grades of steel, which are being despatched to munitions makers, etc., on a very heavy scale, and it is certain that demand in this direction will become still more insistent. Hence the need for adjusting production in the light of future requirements even at the expense of other descriptions of steel not playing such an important part in the war effort. Cold-rolled strip and bright drawn steel bars are fully absorbed. Most of the sheet mills are still well employed, but there has been some recession in the demand. Plates are as keenly taken up as ever.

Scrap

With the exception of certain descriptions of steel material, the scrap situation continues to be satisfactory. Merchants are being called upon to deliver very large tonnages, especially to the steelworks, and there is no sign of any falling off in the demand, except, perhaps, for some of the lighter qualities. Many consumers are in the happy position of having big reserves of scrap, and in some cases further deliveries have been temporarily suspended.

Metals

COPPER—Restrictions on the use of copper have been imposed in many countries, including the United Kingdom, for a long time past, but American industry has only recently been seriously affected by the conservation of supplies for the defence programme. Now, however, it is quite clear that users in the United States will have to readjust themselves to the position, for still more cuts in the allocations to ordinary consumers will inevitably follow. The absence of unified control over copper has been apparent, and is likely to cause further inconvenience in the future, as, in the U.S., the rationing of the metal is the responsibility of the Office of Production Management, prices come under the wing of the Price Administrator, while purchases of copper are made by the Metals Reserve Company, which is a subsidiary of the Reconstruction Finance Corporation. Owing to this lack of unification, there has been considerable delay over the question of granting subsidies to high-cost producers.

There is nothing fresh to report with regard to copper in this country; the metal is only being distributed to essential consumers, except in a few instances where it is deemed wise to despatch supplies for important orders outside the priority category.

TIN—The Board of Trade is understood to be considering a request from London Metal Exchange interests for a resumption of the issue of tin export licences, which have been suspended since May 15 last. At that time stocks of tin in this country were declining, but the position has changed, and it is felt that shipments to the United States could again be made without imperilling our own supply. It is certain that there would be ready buyers on the other side of the Atlantic. Should the Board of Trade agree to the proposal, it is unlikely that licences would be granted for more than about 10 per cent. of applications. Prices in London have become firmer upon the possibility of a resumption of exports. The Eastern price has recently been nearer the American level, so that deliveries to the United States, which in October totalled only 8,000 tons, may shortly show an expansion. As reported in our last issue, Russian purchases of tin in the future are likely to be regularised at around 1,000 to 1,500 tons a month, thus giving American buyers an opportunity to resume purchasing.

Tin prices on the London Metal Exchange during the past week have been as follow:—

Cash—Thursday, £255 15s. to £256; Friday, £255 10s. to £256; Monday, £256 to £256 5s.; Tuesday, £256 10s. to £257; Wednesday, £257 5s. to £257 10s.

Three Months—Thursday, £259 10s. to £259 15s.; Friday, £259 10s. to £260; Monday, £259 10s. to £260; Tuesday, £260 to £260 5s.; Wednesday, £260 10s. to £260 15s.

SPELTER—War requirements of this metal continue to make it impossible for the Control to despatch supplies to other than essential consumers. Ample tonnages are available for priority needs, but the authorities are naturally anxious to ensure that future supplies are not imperilled by indiscriminate distribution at the present time. Brassmakers and die-casters are large users of the metal, while a fair tonnage of g.o.b. is being taken up by galvanisers.

LEAD—Apart from cable and battery makers, who are employed on war contracts, there is little urgent demand for lead, unless one takes into account the requirements of Russia and America. It is likely that stocks of lead here are at an impressive level, as consumption has been comparatively slack during the period of hostilities.

SCRAP—The position of non-ferrous metal scrap has improved of late, although it is to be hoped that the situation will be considered more fully by the authorities, as it is still extremely difficult to move certain descriptions, and it is obvious that scrap is not yet playing its full part.

Problems of the German Steel Industry

At the spring meeting of the South-Western Branch of the Verein deutscher Eisenhüttenleute held at Saarbrücken, Dr. Hermann Röchling in the chair, a report of which has just been received, the chairman called attention to various problems which war conditions had imposed on the German iron and steel industry. These included the utilisation of the minimum quantity of coal to produce the maximum output of iron and steel, the exploitation as far as possible of low-grade ores, every care and effort in the preparation of blast-furnace charges, and a progressive improvement in the quality of finished iron and steel products. Much remained to be done in ameliorating the fuel problem in Lorraine, while urgent improvements were required in the quality of basic-Bessemer steel, especially in view of the large capacity for making this grade of steel which was now at the disposal of Germany in the conquered western countries The coal problem was discussed in a Paper by Gauamtsleiter Kelchner, entitled "Coal as a Principal Raw Material of Industry." Among other Papers was one by Dr.-Ing. H. Verfürth on the restarting of the Lorraine iron and steel industry, calling attention, among other matters, to the difficulty of reconstituting the transport system and outlining the preliminary work which had to be done so as to enable the first pig-iron to be produced in conquered Lorraine on July 27, 1940. The principal Paper of the meeting was one by Staatsminister Prof. Dr. Paul Schmitthenner on the "Sinn" of the present war, which traced the origin of the present struggle to the year of the Peace of Westphalia, *viz.*, 1648.